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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/733,884	12/03/2003	Jae Suk Lee	OF03P212/US	1568
36872	7590	03/25/2005	EXAMINER	
THE LAW OFFICES OF ANDREW D. FORTNEY, PH.D., P.C. 7257 N. MAPLE AVENUE BLDG. D, 3107 FRESNO, CA 93720			DANG, TRUNG Q	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/733,884

Applicant(s)

LEE ET AL.

Examiner

Trung Dang

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 1/5/05.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-21 is/are pending in the application.
- 4a) Of the above claim(s) 10-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Newly submitted claims 10-21 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:
2. This application contains claims directed to the following patentably distinct species of the claimed invention:

Group A, claims 1, 3-9, is directed to a method in which a plurality of parts of an insulating layer are recessed into the insulating layer as a result of the claimed step of “etching parts of the insulating layer where a plurality of via holes will be formed to a certain thickness so as not to expose the first conductive line”

Group B, claims 10-15, is directed to a method in which a plurality of parts of an insulating layer are not limited to be recessed into the insulating layer

Applicant is required under 35 U.S.C. 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no generic claim is finally held to be allowable. Currently, claim 10 is generic.

Applicant is advised that a reply to this requirement must include an identification of the species that is elected consonant with this requirement, and a listing of all claims readable thereon, including any claims subsequently added.

An argument that a claim is allowable or that all claims are generic is considered nonresponsive unless accompanied by an election.

Upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

Should applicant traverse on the ground that the species are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the species to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

3. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claims 1 and 3-9, drawn to a method of manufacturing a semiconductor device, classified in class 438, subclass 637.

II. Claims 16-21, drawn to a semiconductor device, classified in class

257, subclass 758.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product as claimed can be made by another and materially different process, for example, etching a plurality of via holes exposing the first conductive layer followed by etching a plurality of parts of the insulating layer to a certain thickness greater than zero but less than the insulating layer thickness. Note that the process of claim 1 requires the etching parts of the insulating layer is performed prior to the etching a plurality of via holes.

4. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

5. Because these inventions are distinct for the reasons given above and the search required for Group I invention is not required for Group II invention,

restriction for examination purposes as indicated is proper.

6. Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 10-15 and 16-21 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

8. Claims 1, 3-7, and 9 are rejected under 35 U.S.C. 102(e) as being anticipated by Agarwala et al. (US 6,734,090 cited in the previous Office action).

With reference to Figs. 3A to 3E, the prior art teaches the invention as claimed in that it discloses a method comprising the steps of:

- forming a first conductive line 24 on a semiconductor substrate;
- forming an insulating layer 14 on the semiconductor substrate and the first conductive line;
- etching parts of the insulating layer where a plurality of via holes will be formed to a certain thickness so as not to expose the first conductive line (Fig. 3B and col. 6, lines 28-32);
- selectively etching a plurality of via holes in each of said parts of the insulating layer in order to expose the first conductive line (Fig. 3B and col. 6, lines 32-40);
- etching trenches in the insulating layer to a certain thickness;
- forming a metal barrier 36 on the insulating layer and the via holes; and
- forming a plug by depositing a conductive layer sufficiently to fill the via holes, and then planarizing the conductive layer until the conductive layer is substantially coplanar with the insulating layer (Fig. 3E).

Note the following interpretations explaining as to how the process of the prior art meets the claim limitations:

a) The partial etching of the insulating layer 14 to form partial via holes (i.e., via holes are etched to a certain thickness of the insulating layer 14 so as not to exposes the first conductive layer 24 (see col. 6, lines 28-32)). Therefore, this step reads on the claimed limitation “etching parts of the insulating layer where a plurality of via holes will be formed to a certain thickness so as not to expose the first conductive line” because the parts of the insulating layer 14 where the partial via holes are formed are also the parts of the remaining via holes will be formed such that the via holes expose the conductive layer 24.

b) After the process in a), the etching to form metal interconnect line trench 28 is performed using a mask pattern formed by a photolithographic process (known in the art as the use of a patterned photoresist as a mask). This etching step also forms the remaining via holes such that via holes 26 exposes metal layer 24 (col. 6, lines 32-40). Thus, this step reads on the claimed limitation “selectively etching a plurality of via holes in each of said parts of the insulating layer in order to expose the first conductive line and etching trenches in the insulating layer to a certain thickness” since the claim does not limit to the etching of via holes and the etching of trenches being performed in two distinct steps.

For claim 3, the partial etch step described in a) using mask pattern formed by a photolithographic process (col. 6, lines 28-30), that is using a photoresist pattern that reads on the claimed first photoresist pattern. Similarly, the etch step to form opening 28 and the remaining via holes using a second photolithographic mask pattern that reads on the claimed second photoresist pattern.

For claim 4, since claim 4 depends on claim 1, and claim 1 does not recite a first or second photoresist pattern therefore the second photoresist pattern that is used in the above step a) for the etching of trench 28 reads on the claimed third photoresist pattern.

For claim 5 and 6 the lower copper layer 42 depicted in Fig. 3F reads on the claimed limitation “the first conductive line comprises copper”.

For claims 6 and 7, see col. 7, lines 1-8.

For claim 9, Fig. 3B shows two via holes 26 having a combined width equal to a width of corresponding insulating part (see the insulating portion in between two via holes 26).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Agarwala et al. as above in view of Jahnes et al. of record.

Agarwala teaches a double damascene process as described above.

Agarwala differs from the claim in not disclosing that the first conductive line 24 is formed by sputtering and then patterning the metal layer using photolithography and etching process.

Jahnes teaches a dual damascene process in which tungsten is used for the first level of conductive line. The conductive line is formed by sputtering followed by a photolithography and etching process (col. 3, lines 54-67).

It would have been obvious to one of ordinary skill in the art to modify Agarwala's teaching by forming the conducting layer 24 by sputtering and then patterning the metal layer 24 using photolithography and etching process as suggested by Jahnes because such technique of forming a patterned metal layer is conventional in the art, and the application of a known process to make the same would have been within the level of one skilled in the art.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax

phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823



3/21/05